

# Transferability in Robotics

Friday 15 March 2024, Rimini (Italy)

11:40 – 13:00, Room Tempio 1

<https://erf2024.eu/15-march/>

## Organizers

**Aude Billard**

École Polytechnique Fédérale de Lausanne (EPFL)

Learning Algorithms and Systems Laboratory

**Danica Kragic**

School of Electrical Engineering and Computer Science, Royal Institute of Technology (KTH)

Centre for Autonomous Systems Robotics, Perception and Learning Lab

## Zoom link

Meeting-ID: 682 0572 8724

Code: 811576

<https://tum-conf.zoom->

[x.de/j/68205728724?pwd=THBLbElMSGZacFhsSi9HSDEzUmpiQT09](https://tum-conf.zoom-x.de/j/68205728724?pwd=THBLbElMSGZacFhsSi9HSDEzUmpiQT09)

## Workshop introduction and Session Chair



**Alin Albu-Schäffer (euROBIN Project Coordinator)**

DLR German Aerospace Center, Institute of Robotics and Mechatronics

The talk will give an overview of the euROBIN Network of Excellence in AI-powered robotics, on its general goals and achievements during the first year. A special focus will be on its main scientific question, namely how to achieve transferability between robots, tasks and environments.

**Aleš Ude (Session Chair)**

Jožef Stefan Institute, Humanoid and Cognitive Robotics Lab (HCR)

The workshop will cover the three forms of transferability considered in robotics: task/skill transfer, knowledge transfer, and embodiment transfer. These topics will be explored during the presentations from the speakers and discussed later with the panel and the attendees.



### Andrej Gams

Department of Automatics, Biocybernetics and Robotics, Jožef Stefan Institute, Ljubljana, Slovenia



In the talk I will briefly present a part of a recent survey composed with colleagues from KTH, EPFL, and KIT within the scope of euROBIN, titled: "Transfer Learning in Robotics: An Upcoming Breakthrough? A Review of Promises and Challenges". While the survey itself covers many more aspects of reusing prior knowledge to learn in and from novel situations, the talk will focus on the aspects of abstraction levels and task transfer in robotics. Based on previous successes of Transfer Learning in Robotics, a few examples of task transfers will be shown.

### Bernardo Fichera

Learning Algorithms and Systems Laboratory, École polytechnique fédérale de Lausanne

In the talk, I will present a segment of a recent survey conducted with colleagues from KTH, JSI, and KIT within the framework of euROBIN, titled: "Transfer Learning in Robotics: An Upcoming Breakthrough? A Review of Promises and Challenges." The talk will focus on providing a unified view of transfer learning in robotics, drawing inspiration from machine learning taxonomies, and defining a taxonomy of transfer learning scenarios that occur in robotics. Based on the defined taxonomy, the process of defining metrics for transfer learning in robotics will be briefly discussed.



### Rudolph Triebel

German Aerospace Center (DLR) and Karlsruhe Institute of Technology (KIT)



Knowledge acquisition in robotics, be it model-based or data-driven, is often formulated as a platform- and task-specific process. However, a large potential benefit can be achieved by exploiting knowledge from different robot tasks or agents. In my talk, I will focus on perception tasks such as environment mapping and object detection. In particular, I will show recent examples from the domains of planetary exploration and field robotics, where sharing knowledge about maps or object classes helps to improve the performance in tasks such as robot navigation or object manipulation.

### Ilias El Makrini

Vrije Universiteit Brussel, Faculty of Applied Sciences, Robotics & Multibody Research Group

Efficiently managing multi-modal data remains a formidable task. In the AugmentX infrastructure project, researchers faced challenges in creating an integrated platform to evaluate occupational exoskeletons. Our toolkit includes motion capture devices, force gauges, and physiological sensors—balancing accuracy and mobility. Overcoming hurdles involves synchronizing diverse equipment, ensuring modularity, and integrating new sensors seamlessly. We introduce PhysioSense, a Lab Streaming Layer framework, enabling multi-modal monitoring for ergonomic assessment and human-robot interaction, and demonstrate its effectiveness in real industrial scenarios.



## Panel discussion

Markus Vincze, TU Wien

Anibal Ollero, University of Seville

Uwe Köckermann, Örebro University

## Program

Time	Speaker/Title	Topic
5 min	Alin Albu-Schäffer	Transferability in euROBIN
5 min	Aleš Ude	Transferability in Robotics
12 min	Andrej Gams, "Promises and Challenges of Transfer Learning in Robotics: Task Transfer"	Task/Skill Transfer
12 min	Bernardo Fichera, "Transfer Learning: From Machine Learning to Robotics"	Machine Learning
12 min	Rudolph Triebel, "Transferring knowledge for perception across robot tasks and systems"	Knowledge Transfer
12 min	Ilias El Makrini, "Embodiment Transfer in Human-Robot Interaction: PhysioSense Framework for Ergonomics Assessment"	Embodiment Transfer
15 min	Speakers and Discussion Panel	Open discussion
7 min	Aleš Ude, all	Conclusions from WS

## Recommended reading

Noémie Jaquier, Michael C. Welle, Andrej Gams, Kunpeng Yao, Bernardo Fichera, Aude Billard, Aleš Ude, Tamim Asfour, Danica Kragic, "Transfer Learning in Robotics: An Upcoming Breakthrough? A Review of Promises and Challenges"

<https://arxiv.org/abs/2311.18044>

<https://www.eurobin-project.eu/>